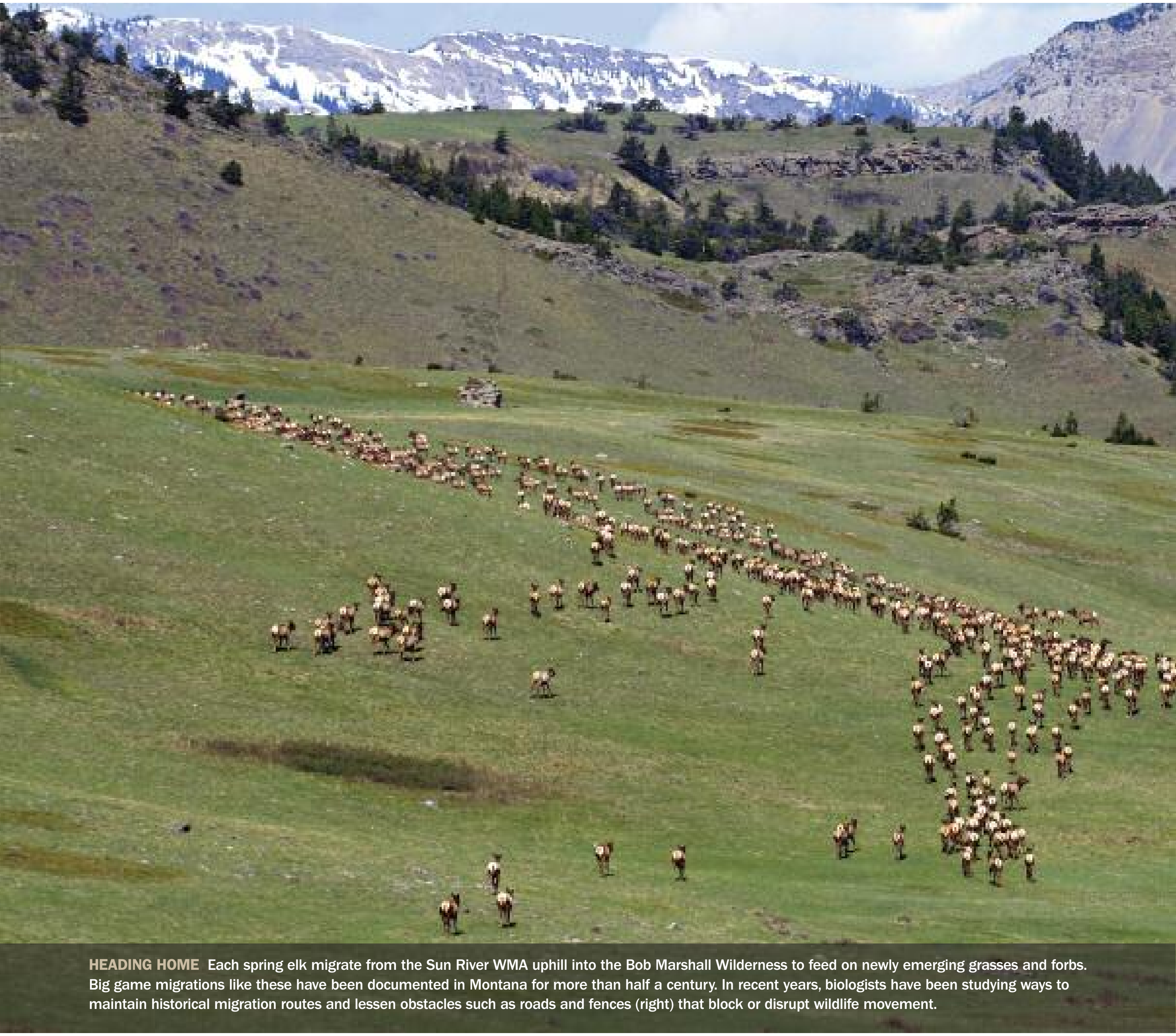
SPECIAL REPORT

INCREDIBLE

Many big game animals must migrate to survive. For growing numbers,



HEADING HOME Each spring elk migrate from the Sun River WMA uphill into the Bob Marshall Wilderness to feed on newly emerging grasses and forbs. Big game migrations like these have been documented in Montana for more than half a century. In recent years, biologists have been studying ways to maintain historical migration routes and lessen obstacles such as roads and fences (right) that block or disrupt wildlife movement.

JOURNEYS

that's getting harder each year. BY JIM WILLIAMS AND TOM DICKSON

Everyone knows most bird species migrate. Waterfowl, warblers, and other winged wildlife spend summers in Montana then fly south a thousand miles or more to winter along the Gulf of Mexico or even farther south.

But who knew the seasonal movements of big game species such as bighorn sheep and white-tailed deer are also migrations? Though unable to fly, they—along with elk, mule deer, and pronghorn—must travel to and from distinct habitats just as birds do—and sometimes for remarkable distances.

For instance, Montana Fish, Wildlife & Parks wildlife biologists have tracked mule deer in northeastern Montana moving an average of 64 miles from winter range west of Glasgow to summer fawn-rearing sites in Saskatchewan. Canadian pronghorn head south for 100 miles or more to reach winter range in Montana's Missouri River Breaks. Elk that summer in central Yellowstone National Park travel up to 125 miles north along the Paradise Valley to winter at Dome Mountain Wildlife Management Area.

Even animals not considered long-distance travelers can't stay put all year. In and around Glacier National Park, mountain goats clamber across several miles of rocky cliffs every summer to reach mineral licks. Moose living in the Cabinet Mountains Wilderness travel a dozen miles each December from alpine lake basins downhill to the Fisher River Basin near Libby. Grizzly bears

LEFT: BRENT LONNER; RIGHT: PAUL QUENEAU

make seasonal "food migrations" to find high-protein fare such as Army cutworm moths and whitebark pine cone seeds.

"It's a simple fact that most big game animals need to move seasonally to another region to avoid bad weather or find better feeding or breeding conditions," says Joel Berger, a senior conservation scientist with the Wildlife Conservation Society and the John J. Craighead Chair in wildlife biology at the University of Montana (UM).

That movement carries risks such as exposure to predators and increased energy expenditures. Big game animals must sense whether the trip is worth the effort. For many, the answer is yes. Staying put is not an option, explains Kerry Foresman, a UM professor of biology. "A bighorn sheep ewe needs to be in a much different place to rear her lamb in summer than to survive in winter," he says.

Though many wildlife species must travel far and repeatedly each year to survive, that movement has become increasingly difficult. New residential sprawl in western Montana and booming oil and gas fields in the east produce miles and miles of new fences and roads. These obstacles often disrupt "connectivity"—the degree to which the landscape allows animals to move from one place to another. "Big game migration is an ecological process that has operated for thousands if not millions of years," says Berger. "But as parts of the West become more crowded, with increased subdivision and energy development, connectivity is being broken and migrations are quietly and tragically disappearing."

Jim Williams is the FWP regional wildlife manager in Kalispell. Tom Dickson is the editor of Montana Outdoors.

GETTING FROM HERE TO THERE

Conservationists didn't understand the importance of connectivity until relatively recently. For much of the 20th century, they focused on protecting core habitats—such as wildlife management areas (WMAs), national wildlife refuges, and national parks. Save the best habitat, the thinking went, and wildlife populations will survive.

But since the 1970s, scientists have learned that big game animals also need to move between and among core habitats. "It's not one or the other; you have to have both," says Ken McDonald, head of the FWP Wildlife Division. "We need core areas like our WMAs, and we also need to make sure the land is managed to allow populations to stay connected."

In other words, with a little planning, western states can have their cake and eat it, too.

When animals can't move back and forth between core habitats, populations suffer. Migrating pronghorn blocked by woven wire fence can perish in winter cold. Adult grizzly bear females unable to reach high-calorie foods in fall may not produce cubs during hibernation. Mule deer numbers dwindle where habitat is fragmented by new roads crisscrossing oil and gas developments.

Then there's the problem of genetic isolation. Disconnected populations unable to mate with others can lose the genetic diversity and resiliency that helps them ward off disease and survive natural disasters.

MAINTAINING CONNECTIVITY

Conservation groups, state agencies, and others are trying different ways to maintain connectivity and big game mobility. "The main goal is to make the landscape permeable to wildlife movement," says Foresman. One approach is to manage landscapes between protected core habitats so animals can continue traveling back and forth. For instance, FWP helps grizzly bears move across the landscape safely by teaching black bear hunters how to distinguish between the two species and avoid accidental shootings. Other measures include restricting motorized use in the backcountry to protect wildlife raising young, convincing energy

Following Footprints

In 1945, Merle Rognrud, one of FWP's first wildlife biologists, looks for bighorn sheep in what is today the Bob Marshall Wilderness.

The timeline at right highlights significant research projects on big game movement by (unless indicated otherwise) FWP wildlife biologists working with Montana State University.

Pioneering biologists such as Bob Cooney, Merle Rognrud, Harold Picton, and Jerry Brown first documented migrations by following animals far into the backcountry on horseback or by foot or snowshoe. Before radiotelemetry, tracking individual big game animals was nearly impossible. Brown sometimes strung rope pendants with visible numbers around the necks of trapped bighorn sheep. After the animals were released, he would then climb steep mountains to see where they went. Sometimes the biologist would carry a ladder on his treks just to gain a few more feet in elevation to better view the wild sheep.

Other FWP biologists who conducted important big game migration studies over the past several decades include, but are not limited to, the names listed in the timeline shown at right and Eugene Allen, Vanna Boccadori, John Cada, John Carnes, Kerry Constan, Jim Cross, Nick DeCesare, Rich DeSimone, John Firebaugh, Arnold Foss, Mike Frisina, Adam Grove, Bob Henderson, Bernie Hildebrand, Richard Knight, Tom Lemke, Allan Lovaas, Gary Olson, Joel Peterson, Kelly Proffitt, Allen Schallenberger, Claire Simmons, Sonja Smith, Bruce Sterling, Shawn Stewart, Dwight Stockstad, Graham Taylor, Joe Weigand, Harold Wentland.

THROUGH THE WOODS The longest documented annual white-tailed deer migration in Montana occurs in the Swan Valley, where deer travel roughly 44 miles from dense conifer winter habitat at Goat and Squeezer Creeks south to summer grounds at Seeley Lake.

companies to fragment less habitat, and asking ranchers in key migration routes to alter some fences a few times a year.

"Maintaining connectivity doesn't mean moving people off the landscape," says Berger. "But it does require letting people know how they can live in migration routes without impeding wildlife movement."

Montana has anchored many big game migrations by acquiring what were originally called game ranges, now known as WMAs. The Judith River, Sun River, Wall Creek, Mount Silcox, and many other WMAs were bought to protect winter elk habitat while reducing damage to private land by hungry elk.

Also sustaining big game migrations are conservation easements—legal agreements purchased by land trusts and FWP that prevent subdividing on private land and the accompanying fences and roads that go with it. Over the past 35 years, FWP's Habitat Montana Program has used hunter license dollars to protect and enhance several hundred thousand acres of wildlife habitat, mainly with conservation easements.

In the western forested region, the Montana Legacy Project maintained connectivity by allowing FWP, the Montana Department of Natural Resources and Conservation, and the U.S. Forest Service to purchase and secure more than 300,000 acres of private Plum Creek timberlands.

Big game animals also use wildlife corridors that link two or more core areas. Some are natural, such as wooded rivers connecting national forests with WMAs or conservation easements. Others are man-made, like the 42 wildlife passageway culverts recently installed under stretches of U.S. Highway 93 by the Confederated Salish and Kootenai Tribes and Montana Department of Transportation.

Often unrecognized for their essential role in maintaining connectivity are Montana landowners who tolerate large numbers of wildlife on and moving across their property. According to McDonald, private ranch and farm lands in Montana host more seasonal migrations—mainly elk, pronghorn, and mule deer—than public land holdings. "Tolerance in this state is huge," he says.

ON A COLLISION COURSE

Montana and several other western states are now starting to recognize the economic logic of maintaining connectivity through science-based land-use planning. "It's a whole lot cheaper to protect wildlife corridors before doing things like energy development than to try to go in afterward and re-create them," says Sterling Miller, a senior scientist with the National Wildlife Federation in Missoula. In 2007 the Western Governors' Association called for a new approach to energy and residential development. The association created a wildlife council to identify where existing migration routes would be damaged by proposed energy development. "The governors could see they were on a collision course, where the desire to develop energy was conflicting with wildlife, which is hugely important in the West," says Steve Torbit, an expert on

ALL PHOTOS FROM FWP ARCHIVES

1940 — 1950 — 1960 — 1970 — 1980

1941 GRIZZLY
Bob Marshall Primitive Area
Bob Cooney

1949 ELK
Bob Marshall Primitive Area
Merle Rognrud

1950 BIGHORN SHEEP
Sun River
Faye Couey

1950 MOUNTAIN GOAT
Bob Marshall
Primitive Area
Robert Casebeer

1953 ELK
Porcupine-Gallatin
Arthur Brazda

1960 GRIZZLY
Yellowstone
National Park
John and Frank
Craighead[1]

1960 ELK
Sun River
Harold Picton

1967 PRONGHORN
Yellow Water Triangle
Duane Pyrah,
Stephen Bayless

1970 BIGHORN SHEEP
Sun River
Glenn Erickson

1975 MOUNTAIN GOAT
Middle Fork
Flathead Lick
Francis Singer[3]

1975-85 GRIZZLY
Border Grizzly Project
Chuck Jonkel

1978 ELK
Fleecer WMA
Terry Lonner

1980 WHITE-TAILED DEER
Squeezer Creek
John Mundinger

1981 MULE DEER
Rocky Mountain Front
Wayne Kasworm,
Helga Ihsle

1981 MOUNTAIN GOAT
Blackleaf Lick
Gayle Joslin,
Mike Thompson

Continued on page 24

landscape conservation for the U.S. Fish & Wildlife Service's Prairie-Mountain Region. "They realized that by mapping core areas and wildlife routes, development could still occur while keeping the landscape permeable to wildlife movement."

In other words, with a little planning, western states can have their cake and eat it, too.

For that to happen, biologists, planners, and decisionmakers must know which routes wildlife use and what obstructs or disrupts that movement. This is where research comes in. "We need to understand the animals' responses to natural areas and human development," says Justin Gude, who manages FWP's wildlife research activities. "Does this corridor work? Is this landscape connected? The answer completely depends on the species."

FWP biologists have been tracking wildlife migrations since the 1950s, when they followed elk and sheep by horseback. Using telemetry in the 1960s, biologists began documenting more migration routes. Now with GPS satellite technology, research scientists are finding that Montana big game animals move farther than ever imagined.

In one recent study, biologists learned that a single pronghorn traveled more than 350 miles as it fled brutal winter conditions in search of food and shelter south of Glasgow. An aerial photo from that same study showed a mile-long herd of 400 pronghorn migrating south across east-central Montana in temperatures of nearly -40 F. The picture shows the antelope, blocked by a barbed-wire fence, lying down in the brutal cold to conserve energy. Biologists later learned the animals eventually found a gap in the wire and continued their journey.

But that was just one fence.

"We've secured many core habitats," says McDonald. "Now we need to know where the animals are going, what obstacles are in their way, and what can be done to reduce barriers and conserve those historical routes."

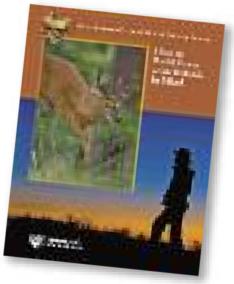
The data in this article comes from 173 Montana radiotelemetry studies and other reports dating to the 1950s that Jim Williams recently compiled. His goal was to document a sample of average distances covered by different species to and from winter and summer ranges and, in some cases, the routes they took.

This large database represents just a portion of what biologists must learn to conserve big game migration routes. Future aerial surveys and studies will help conservationists and policymakers accommodate sensible residential and energy development across Montana while ensuring that landscapes remain permeable to critical wildlife movement.

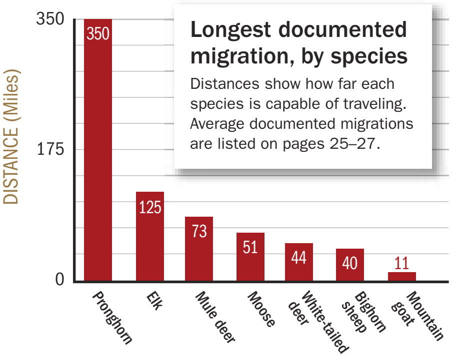
MAPS AND GUIDES FOR PLANNING, FENCING

♦ The FWP website provides **recommendations on subdivision development** to help communities accommodate new housing while retaining healthy wildlife habitat and migration routes. Visit fwp.mt.gov and search for "subdivision."

♦ FWP has mapped all crucial wildlife habitats in Montana and makes that information available to planners, developers, and others through its web-based **Crucial Areas Planning System (CAPS)**. Visit fwp.mt.gov and search for "Crucial Areas."



♦ The department has recently revised its **guide to building and altering fences** to allow migrating wildlife to move more freely. The booklet contains diagrams, instructions, and advice on creating fences that reduce entanglements and barriers. Get a free copy by calling Joe Weigand, FWP private land wildlife specialist, at (406) 444-3065.



1981 BIGHORN SHEEP
Beartooth Rock Creek
Steve Martin

1985 MOOSE
Yaak River
Randy Matchett

1989 MULE DEER
Missouri Breaks
Ken Hamlin,
Richard Mackie

1989 GRIZZLY
Teton River
Keith Aune,
Wayne Kasworm

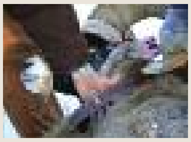
1990 ELK
Dome Mountain WMA
John Vore

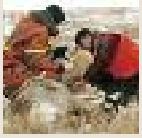
1991 MULE DEER
Bridger Mountains
Dave Pac,
Richard Mackie

1994 ELK
Blackfoot-Clearwater WMA
Mark Hurley[2]

1997 GRIZZLY
South Fork Study
Rick Mace

2002 ELK
West Yellowstone
Ken Hamlin,
Mike Ross





2006 WHITE-TAILED DEER
Ray Kuhns WMA
Gary Dusek, John Morgan,
Carolyn Sime, Alan Wood

2008 BIGHORN SHEEP
Mount Silcox WMA
Kerry Foresman[4]

2009 MULE DEER
Bitter Creek
Pat Gunderson

2009 ELK
Dome Mountain WMA
Ken Hamlin,
Julie Cunningham,
Bob Garrott

2011 GRIZZLY
Rocky Mtn. Front
Mike Madel

2012 GRIZZLY
Swan Valley
Rick Mace
Tonya Chilton

2012 PRONGHORN
Bitter Creek
Andrew Jakes[5]

2013 ELK
Flathead Indian
Reservation
Dale Becker[6],
Stacy Courville[6]

1. Independent research
2. UM master's degree thesis
3. Glacier National Park report
4. University of Montana research
5. University of Calgary Ph.D. thesis
6. Confederated Salish Kootenai Tribes

ALL PHOTOS THIS PAGE FROM FWP ARCHIVES

EXAMPLES OF BIG GAME MIGRATIONS

White-tailed deer

Average/longest documented migration distance: 12/44 miles

Major migration concerns: Roads and fences from new subdivisions; removal of conifers on winter range

In much of the United States, whitetails don't need to move far. They usually find all the food and shelter they require within a few square miles of woodlots, suburbs, and corn fields. But in the mountainous West, white-tailed deer must often travel many miles to find livable conditions, especially in winter. Based on 40 years of radio-tracking data, FWP biologists know that whitetails migrate to dense forests during cold months. While staying protected in the forest, the animals move down in elevation as far as possible in search of habitat containing conifer needles to eat, overhead tree canopy to intercept snow (so they can move around more easily), and thermal protection created by dense stands of second-growth Douglas fir and other evergreens.

The longest documented whitetail migration in Montana is of deer moving in late fall from the Seeley Lake area through the Seeley-Swan Valley to Goat and Squeezer Creeks, roughly 44 miles each way. The Montana Legacy Project, which converted private Plum Creek timberlands into public holdings, protects most of the Seeley-Swan landscape and the migrations it supports.

LEFT TO RIGHT: DONALDMJONES.COM; FWP

Moose

Average/longest documented migration distance: 12/51 miles

Major migration concerns: Vehicle collisions in valley winter range; climate change that reduces and isolates cool, wet habitats; predators in some areas

Moose are one of the state's least-studied big game animals. Biologists know little of their seasonal movements or migrations except that moose summer in high-elevation forests and then, in fall, move to staging areas at mid-elevation in or near clear-cuts or burned areas. In winter, moose continue downhill to low-elevation forests. One study found that moose in the Cabinet Mountains Wilderness near Libby migrated each winter roughly 15 miles from summer habitat in alpine cirques downhill to the Fisher River Basin. FWP recently began a study of moose ecology, including migration, in the Big Hole Valley, in the Cabinet Mountains, and along the Rocky Mountain Front to learn more about the species' movements and habitat requirements.

Bighorn sheep

Average/longest documented migration distance: 8/40 miles

Major migration concerns: Vehicle collisions when in valley winter range; disease

Bighorn sheep migrate along historical routes from summer habitat in high mountain areas to winter grazing grounds in the foothills. In spring they reverse course and follow new vegetation growth from

low-elevation winter range to alpine summer range. Some wild sheep, such as those in the Bob Marshall Wilderness, migrate just a few miles, while others travel 40 miles each way. One FWP study followed radio-collared bighorns moving from winter range at the Beartooth Face near Red Lodge across the Beartooth Plateau to summer range at Wolverine Peak near Cooke City. Biologists found that these family groups, composed mainly of ewes with their young lambs, traveled an average of 8 miles per day for four or five days before reaching new seasonal habitat. Near Thompson Falls, scientists have tracked bighorn migrating from the high reaches of Marmot Peak south down Sundance Ridge then along cliff faces to winter range in the Mount Silcox WMA.

Because bighorn sheep don't deviate from established seasonal ranges and migration courses, biologists speculate that most of the animals follow routes thousands of years old, established since the last ice age.

Elk

Average/longest documented migration distance: 15/125 miles

Major migration concerns: Loss of winter range from residental development; predators in some areas

Elk are the most well-known big game migrators in Montana. Hunters, ranchers, and others have long known that elk spend summers high in the mountains. When cold and snow arrive, they move to lower-elevation foothills in search of exposed, windblown bunchgrass. Unfortunately for some ranchers, these areas are also prime cattle rangelands. Responding to elk migrations in winter, FWP purchased in the mid-1900s the state's first game ranges along the Judith River and the Sun River. The idea was to manage winter habitat to support more elk while luring many of the animals away from adjacent ranchlands, where they competed with cattle for grass and knocked down fences.

Elk migrations range from just 15 miles, such as between the Sun River WMA and the Bob Marshall Wilderness, to 125 miles, like the one from winter range in Dome Mountain WMA in the Paradise Valley to summer range high in Yellowstone National Park.

Because most early game range acquisitions were for elk winter habitat, more migration routes have been conserved for this species than any other in Montana.

Mountain goat

Average/longest documented migration distance: 5/11 miles

Major migration concerns: Climate change that reduces and isolates cold and snowy alpine habitats

Some mountain goats migrate several miles or more from summer range downhill to distinct winter range. Those that don't migrate still move around from season to season within their home range.

Many mountain goats also make a "lick migration." Because their winter foods lack essential minerals such as salt, the animals migrate up to 10 miles in late spring to reach exposed cliff faces where they can lick potassium, calcium, and especially sodium from rocks. For instance, goats that spend much of the year at Our Lake, an alpine basin along the Rocky Mountain Front northwest of Choteau, will travel 5 miles over steep terrain to reach licks at Billie and Deep Creeks. Mountain goats remain at mineral (salt) licks for a few weeks up to more than a month before returning to their primary habitat.

BIGHORN PHOTO: PAUL QUENEAU; ELK: W. STEVE SHERMAN; MOUNTAIN GOAT: LARRY STOLTE

Grizzly bear

Longest documented fall chokecherry "migration": 175 miles

Major connectivity concerns: Roads that increase illegal kills and vehicle collisions; residential development that increases garbage problems that require bear removal; climate change that could lessen wild berry and whitebark pine production

Grizzly bears don't migrate in herds like pronghorn or elk, but they do move as individuals or small family units throughout the year in search of fattening foods. One documented "food migration" is from the Rocky Mountain Front east along creek drainages flowing into the Teton and Sun Rivers, where the bears find dense stands of chokecherries. West of the Continental Divide, grizzlies move up and down elevation searching for large concentrations of huckleberries or whitebark pine cones.

In summer 2006, one collared bear traveled twice from Lindbergh Lake in the Mission Mountains north along the Swan River to just outside Kalispell in the lower Flathead Valley, searching for ripe chokecherries. The first time he arrived, the fruit wasn't ripe, so he returned to Lindbergh Lake and waited a few more weeks before heading back to find edible berries.

Some grizzly bears also make "moth migrations." In late spring, Army cutworm moths fly from prairie states to high elevations throughout the Rocky Mountains to feed on alpine flower nectar. In August, grizzlies move to higher elevations to feast on the vast moth congregations.

GRIZZLY PHOTO: JOE MCDONALD; PRONGHORN: ERIK PETERSEN; MULE DEER: PAUL QUENEAU

Pronghorn

Average/longest documented migration distance: 46/350 miles

Major migration concerns: Fencing and roads from increased energy development

Most antelope don't need to travel far, meeting their seasonal needs by moving only within their home range. But some make great migrations. Biologists have tracked herds traveling more than 100 miles south from southern Alberta and Saskatchewan into Montana

in winter. Some Canadian herds, perhaps following ancient routes thousands of years old, hit Fort Peck Reservoir and cross its frozen surface, only to be stranded on the lake's south shore in spring.

Mule deer

Average/longest documented migration distance: 12/73 miles

Major migration concerns: In prairies, roads and fences from new energy development; in some mountains, residential development that alters routes and eats up winter range

Many eastern Montana muleys don't migrate but instead move within their home range to find preferred seasonal habitats. But in severe winters, some mule deer must leave the open shortgrass prairie to escape the drifting snow that can strand them in brutally cold temperatures. These muleys travel for miles in search of broken topography such as deep ravines along river breaks. There they find refuge from driving winds and browse edible shrubs exposed on windblown ridges.

Many mountain muleys migrate. Biologists tracked an annual spring migration from the Judith River WMA near Lewistown southwest across the Castle and Little Belt Mountains to summer grounds in the Gallatin Valley. They also documented three generations of mule deer does that migrate from Yellowstone National Park north through the Paradise Valley and over I-90 to winter in lower elevations of the Bridger Mountains. In late fall, some mule deer that summer in the Spotted Bear drainage south of Hungry Horse Reservoir move east across the Bob Marshall Wilderness to Ear Mountain WMA on the Rocky Mountain Front. ■